At the last Electric Service Quality Workshop in September, Staff stated it would issue a short follow-up data request regarding power quality. The Commission recognizes that not everyone who receives this data request will have the experience or information to respond. However, we have circulated the data request to everyone so that everyone is aware of the on-going process related the electric service quality.

Over the course of the workshops we have discussed three broad categories of electric reliability problems: Sustained outages have been defined as interruptions in service lasting more than five minutes and requiring utility intervention to restore service; Momentary outages, for our purposes, have been identified as service interruptions of less than five minutes in which service is restored without utility intervention; Power Quality problems are deviations in the nature or character of the electricity which may affect the performance of customers' electric equipment.

1. From a customer's perspective, how are power quality problems usually described/identified, i.e. what does the customer complain about?

   MU RESPONSE: Our customers rely on us to provide electric service at a voltage that supports proper operation of their electric equipment; i.e., a supply voltage within allowable tolerances. Ways in which power quality problems are communicated to us include:

   - *voltage is low*
   - *bulbs are popping/burning bright*
   - *equipment keeps tripping out*

2. Are the complaints and/or problems different for residential or small commercial customers versus large commercial or industrial customers? If so, please explain how the complaints are different.

   MU RESPONSE: Issues related to harmonics are typically isolated to commercial customers. Voltage issues are not isolated to any customer group.

3. What steps does your utility take to address power quality complaints?

   MU RESPONSE: When requested, we install portable power quality monitoring equipment at the customer's site to assist the customer in the resolution of power quality issue concerns. In addition, we use information received monthly from our energy supplier to assess the need for additional reactive load compensation. We have, in the recent past, installed high capacity capacitor banks and filter banks at many of our 12kV transformers to bring power factor as close to unity as possible.

4. Does your customer call center categorize power quality complaints separately?

   MU RESPONSE: NO

   - If so, how many power quality complaints have there been in the last 12 months? How were these complaints resolved?
   - If not, please estimate how many power quality complaints there has been over the last 12 months and how they were resolved.

5. Are there actions customers can take to insulate their equipment from power quality problems? If so, please explain what actions could be taken.

   MU RESPONSE: Actions taken are the responsibility of the customer, and such action should be taken as required to meet their specific needs. Customers can install electronic power conditioners, harmonic filters and voltage regulators, power conditioners, power filters and transient voltage surge suppression, spike suppression, grounding testing, ground filters, and lightning protection, to name a few.